

# DHÁRWÁR.

## CHAPTER I.

### DESCRIPTION.

**Dhárwár**,<sup>1</sup> between 14° 17' and 15° 50' north latitude, and 74° 48' and 76° east longitude, the southmost district of Bombay, lies on the tableland to the east of the North Kánara Sahyádris separated from the coast by a belt about fifty miles broad. It has an area of 4500 square miles, a population of 882,900 or 194·73 to the square mile, and a realizable land revenue of about £240,000 (Rs. 24,00,000).<sup>2</sup>

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It forms an irregular wedge-shaped figure, about 110 miles long and varying in breadth from about seventy miles in the north to about forty miles near Kod in the south, from which, in the last twenty miles, it narrows to a point. The district is bounded on the north by Belgaum the Rámdurg state and Bádámi in south Bijápúr; on the east by His Highness the Nizám's Ráichor Doáb and the Bellári district of Madras; on the south by Maisur; and on the west by North Kánara and the sub-division of Khánápur in Belgaum. An irregular broken belt of Patvardhan and Sávanur villages with a breadth of ten to twenty miles almost divides the east of the district into two parts, a north and a south. Besides this belt of land some scattered outlying villages lie to the west of Sávanur and there is an isolated patch of estate or *jágir* land at Hebli about five miles north-east of Dhárwár.

BOUNDARIES.

For administrative purposes the 4500 square miles of the district are distributed over eleven sub-divisions. Of these six, Dhárwár and Kalghatgi in the west, Navalgund and Hubli in the centre, and Ron and Gadag in the east, lie to the north of the Sávanur-Patvardhan villages; the seventh sub-division, Bankápur, is mixed with and lies to the west of the Sávanur villages; of the four remaining sub-divisions, Hángal is in the west, Kod in the south-west, Ránebennur in the south-east, and Karajgi in the east of the southern half of the district. The following statement shows that these sub-divisions have an average area of 410 miles 147 villages and 80,260 people:

SUB-DIVISIONS.

<sup>1</sup> From materials supplied by Mr. E. P. Robertson, C.S.

<sup>2</sup> The population and revenue details are for 1881.

## DHÁRWÁR ADMINISTRATIVE DETAILS, 1881-82.

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SUB-DIVISION.	MILES.	VILLAGES.										POPULATION.		LAND REVENUE, 1881-82.	
		Government.				Alienated.				Total.		1881.	Square Mile.		
		Villages.		Hamlets.		Villages.		Hamlets.		Government.	Alienated.				Total.
		Peopled.	Unpeopled.	Peopled.	Unpeopled.	Peopled.	Unpeopled.	Peopled.	Unpeopled.						
Dhārwār ...	425	112	29	2	36	25	6	...	3	179	34	213	111,137	261	27,705
Kalghatgi ...	279	83	24	4	6	17	2	1	...	121	29	141	60,769	181	12,985
Hubli ...	311	71	9	...	6	4	8	...	1	86	8	94	91,997	295	26,056
Navalgund ...	562	85	2	2	1	7	...	...	...	90	7	97	87,832	160	38,286
Ron ...	370	65	...	6	9	4	...	...	...	70	4	74	60,724	164	10,447
Gadag ...	699	83	5	11	10	12	1	...	1	114	14	128	100,338	143	25,740
Karajgi ...	442	124	0	1	10	6	...	...	...	141	6	147	83,216	188	19,232
Bankāpur ...	343	126	10	3	7	13	2	...	1	155	16	171	76,554	223	19,876
Hāngal ...	298	135	6	16	18	30	3	1	2	175	30	211	63,787	220	18,449
Kol ...	400	168	11	4	10	10	...	1	...	193	11	204	80,345	200	18,663
Rānebennur ...	405	110	7	2	12	8	4	...	...	181	12	143	74,213	183	15,804
	4534	1162	118	51	124	186	21	3	8	1455	168	1623	682,907	194	239,242

## ASPECT.

The line of the Poona-Harihar road, which runs north-west and south-east, divides Dhárwár into two very unlike and unequal parts, an irregular belt of hilly and woody country to the west from five to twenty-five miles broad, and to the east a bare plain stretching about sixty miles to the north-east. In the narrow western belt the soil is red and gravelly, the country hilly and woody, the air cool, the rainfall thirty to forty inches, and the water-supply in most places abundant. The villages are generally close together on rising ground with shady sites and poor but hardworking people. Many lakes or reservoirs are used both for drinking and watering, and there is a large watered area of rice-land in the north and centre, and of rice, sugarcane, and betel-palm gardens in the south. To the east of the Harihar road, in the north and centre of the district, the plain is a broad stretch of black soil, flat and bare except for a few ranges of low bushy hills, the rainfall is twenty to thirty inches, and the water-supply is scanty and in places brackish. In the east the villages are large and far apart, generally poorly shaded, and with rich and skilful husbandmen.

## The West.

The Western Belt, which is five to twenty-five miles broad, is part of the rough wooded country along the Sahyádrí water-shed. In the north, the district passes fifteen or twenty miles west of the line of water-shed, the town of Dhárwár fifteen miles from the frontier standing at the water-parting 2420 feet above the sea, the source of streams which flow west to the Indian Ocean and east to the Bay of Bengal. To the south the Dhárwár border passes further east, leaving the water-shed within Kánara limits. All along, in the extreme west, the country is wild with woody hills 100 to 300 feet high, rugged or smooth, flat-topped or pointed, detached or in ranges, many of them, especially those in Kalghatgi Hángal and Bankápur, giving cover to wild pig, deer, panthers, and tigers. Fifty years ago these western hills were occasionally visited by wild elephants. Throughout this western belt ranges of low bushy hills, 300 to 700

feet high, run in parallel lines north-west and south-east. Towards the east the hills gradually grow barer, less rugged, and more isolated, and are separated by broad rich valleys whose tillage spreads up the lower slopes. In the south these lines of hills and isolated peaks are higher and pass further east than in the north. They are better wooded and the valleys between them are more highly tilled, especially with sugarcane and betel-palm gardens, and they are also better supplied with water, dotted with old ponds and lakes, some of them two or three miles long though of no great depth. Near Tilvali, about twelve miles south of Hángal, a grassy bush-covered country is adorned with a thick forest of wild date-palms. The extreme south is crossed from west to east by narrow and steep parallel ranges 400 to 600 feet above the plain.

East of the Poona-Harihar road, in the south and south-east, the country is rocky, bare, and uninteresting, broken by ranges and blocks of stony bush-covered hills, which at Airáni and Kárur in the extreme south rise 500 to 700 feet above the plain. To the north of the southern hills the black soil valley of the Varda crosses the district from west to east. Further north, and east of the belt of Sávanur-Patvardhan villages, the gold-yielding range of Kappatgudd stretches thirty miles north-west from the Tungbhadra, its three or four lines of bare hills rising near Dambal in a steep flat ridge about 1000 feet above the plain. North-east from Dhárwár and Hubli, across the whole breadth of the district, a black soil plain, broken by a few isolated sandstone peaks 300 to 700 feet high, drains north-east into the Bennihalla and other tributaries of the Malprabha. This black soil plain varies greatly at different times of the year. During the rainy and cold seasons, from July to March, the plain is a broad stretch of rich crops of grain, pulse, oil plants, and cotton. In the hot months, though the heat is never so extreme as in parts of Bijápur, the black plain gapes in deep fissures and its bare monotony is relieved by few trees or shrubs and by almost no traces of tillage. Clouds of dust sweep before the parching wind, or move across the plain in huge pillars a hundred feet high. The cheerless view ends in an even wall-like line of sandstone hills.

There are five chief ranges of hills, the Buddangudd in the west, the Airáni in the south-east, the Kappatgudd in the east, and two nameless ranges in the south. The Buddangudd range in the west, separating Kalghatgi from Hubli, is about eight miles long from north to south and about a mile broad. Its highest peak rises about 500 feet above the plain. The hills forming the range are steep, with ridged tops, and are covered with grass and brushwood. This range contains several quarries of good building stone. Smaller hills covered with forest trees lie to the west and north-west. The Airáni range in the south-east corner of the district with a break of five miles runs ten miles from north-west to south-east. The hills of this range are 200 to 700 feet high, those in the north being bare and those in the centre and south covered with brushwood. The highest hill in the range near Airáni on the Tungbhadra is one and a half miles long half a mile broad and 500

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*The Kappatgudd Hills.*

to 700 feet high. The top is pointed, the sides are sloping and woody, and the plain for a mile or two at their base is covered by the only *anjana* *Hardwickia binata* trees in the district. Antelope and wild pig are found in the northern and wolves in the southern hills.

In the east the Kappatgudd range, of iron-clay and slate with traces of gold, rises a little to the south-west of Gadag, and, with ridged or pointed crests, covering a tract four to five miles broad, stretches about thirty miles south-east to the Tungbhadra. Near Gadag the hills are of no great height and are broken by gaps. For about fifteen miles, as far south as Dambal, the range continues irregular and broken, a group of hills some four miles broad with no marked central range and no point more than 500 feet above the plain. Near Dambal there rises a short flat-topped central ridge about 1000 feet above the plain, which, at the south end, breaks into three or four parallel spurs covering at the broadest a tract about five miles across. These hills are 300 to 400 feet high. They are bare even of brushwood, with steep sides and irregular outline, broken by conical and rounded peaks. After a time they gradually close into one range which though cut by the Tungbhadra continues beyond the river. The Kappatgudd hills are crossed by four passes. A well marked level pass between Doni and Attikatti, a winding level pass through much broken ground opposite the village of Hārogeri, a footpath over steep and broken ground sometimes used by laden bullocks opposite the Sāngli village of Hire-Vadavatti, and a pass fit for carts opposite the village of Irāpur. Except by the last hardly any traffic moves through these passes. A few panthers and wild pig are found on the Kappatgudd hills. Of the two parallel ranges in the south which rise 400 to 600 feet from the plain, the northern stretches fourteen miles east and west and shuts out the Masur valley from the north of Kod. This south range, which is a well-marked chain or ridge of hills, is covered with grass and brushwood and formerly gave cover to bears and other large game. Besides a few passes fit for ponies and bullocks there are two cart-roads, one of seven miles between Hirekerur and Masur, and a second of five miles between Ratihālli and Masur. Four to ten miles further south is the southern range which forms the boundary between Kod and Maisur. This range, which is steep and narrow, contains panthers, bears, and occasionally tigers. Its highest hill is Mārāvli (600 feet) called after a village of that name within Maisur limits. The Mārāvli hill is scantily covered with trees. It is crossed by steep tracks fit for ponies, and, at each side of the hill, runs a cart-road from Masur to Shikārpur in Maisur. The rest of the range is low and dies away near the Tungbhadra. Another notable hill in this range is Madak near the Madak lake, about ten miles south of Hirekerur. The sides are bare and steep, and round the top a ruined wall encloses a space 300 yards by 200.

Besides these ranges detached hills are dotted over most of the district. In the north are the three isolated sandstone hills of Navalgund, Nargund, and Chik or Little Nargund, running north-west to south-east. The Navalgund hill is 2640 feet long 990 feet broad and 300 feet high; the Nargund hill, about twelve miles north

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*Detached Hills.*

of Navalgund, is 9174 feet long 3000 feet broad and 700 feet high; and the Chik Nargund hill, about three miles north of Nargund, is 6165 feet long 2640 feet broad and 250 feet high. All three hills are steep in parts, with bare ridged tops, and sides covered with prickly-pear. The Nargund hill is crowned by a ruined fort. In the north-west are several hills one hundred to three hundred feet high. The chief are Tákarinpur about six miles, Sidráyanmardi about thirteen miles, and Durgadgudda about eighteen miles west of Dhárwár; and Pedadkanvi and Hullimardi about thirteen miles and Tolanmardi and Topinhatti about sixteen miles south-west of Dhárwár. Of these hills the highest is Tolanmardi about 300 feet. Sidráyanmardi Hulimardi and Durgadgudda are covered with brushwood, and Pedadkanvi Tolanmardi and Topinhatti with trees. None of them are tilled either on the sides or tops. Two miles north-east of Hubli is the steep and bare ridge of Doddagudd, about a mile long 220 yards broad and 300 feet high. In the west, about four miles west of Kalghatgi, is Ganigudd hill, about half a mile long a quarter of a mile broad and 400 feet high. In the south-east, in the Karajgi sub-division, there are several hills. At Devgiri, about six miles south-west of Karajgi, is a notable hill 300 feet high crowned by a temple of Tirmalappa. At Kanvali, about eight miles south-east of Karajgi, is a conical hill 400 to 500 feet high. Two small pointed hills rise at Kabur twelve miles south-west of Karajgi, several conical bare hills about 150 feet high mark the neighbourhood of Motibennur, and a low bare range stretches north-west and south-east from Biádgi to Halgiri close to Ránebennur and separated from the Airáui hills by eight miles of flat country. In the east, about twenty-three miles south-east of Gadag, the bare, steep, and flat-topped hill-fort of Mundargigudd stands in the plain 200 feet high.

Except a few streams in the north that drain west into the Biddihalla or Gangávali, the rivers and streams of Dhárwár belong to one of two systems, those of the south-west south and south-east that drain into the Tungbhadra, and those of the northern half of the district whose channels run north and north-east to the Malprabha. The only two rivers of importance, the Tungbhadra on the south-east and the Malprabha on the north-east, bound the district on those sides without passing within its limits.

**RIVERS.**

Two streams the TUNG and the BHADRA rise in the south-west frontier of Maisur, and after north-easterly and north-westerly courses of fifty to sixty miles, near Kudli in Maisur, join to form the river TUNGBHADRA. The united stream, after a winding course of about thirty-five miles, touches Dhárwár in the extreme south-east and from that point winds north-east about eighty miles till it enters the Nizám's territory in the south-east of Dambal and falls into the Krishna after a total course of 400 miles. Though in the dry season the Tungbhadra runs low enough to be forded, during the south-west rains it fills a bed over half a mile broad, down which floats of timber pass from the western forests to the open east. In March 1873 a large ferry boat was safely floated from Harihar to Hesur in Dambal where the river leaves Dhárwár, a distance of fully eighty

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*The Tungbhadra.*

miles. At other seasons the river is not navigable. The bed is at places of sand and black earth, but is generally rocky with steep banks. To clear the channel would be a work of great labour and would probably lead to little development of traffic. At Harihar, a large Maisur town on the right bank opposite the eastern limit of Dhárwár, the greatest flood discharge is calculated at 207,000, and the ordinary discharge at 30,000 cubic feet a second. The water of the Tungbhadra is not used for irrigation. Opposite the Gadag village of Korahali huge blocks of stone mark the site of a costly embankment which according to local story gave way immediately after it was built. At Harihar the river is crossed by a fine stone bridge of fourteen spans built in 1868 at a cost of £35,000 (Rs. 3,50,000). During the rains there are ferries at Kulgatti, Mudenur, Airáni, Hirebidri, Chandápur, Haralhalli, and Hávanur. The ferry boats are round wicker baskets covered with leather and three to fifteen feet broad.

*The Varda.*

During its course along the south-east and east borders of Dhárwár the Tungbhadra receives the drainage of the southern half of the district. It has three large feeders, the Varda the Kumadvati and the Hirehalla. The Varda, rising in a hill near Ikeri in North-west Maisur, after a northerly and north-easterly course of about forty miles, enters Dhárwár at the village of Gondi in the Hángal sub-division, and, after winding north-east and east for about fifty miles, falls into the Tungbhadra near the north-east corner of the Karajgi sub-division about thirty miles north of Harihar. It is 100 to 200 yards broad and flows over a sandy or stony bed, generally between steep banks of earth. It is full and deep in the rains, and in Karajgi, when there is a heavy rainfall, it rises to a great height, overflows its banks, and lays the country round under water. In the fair season it lies in long reaches divided by shallows, which are passable for carts between the 10th of November and the 20th of May. Though it is not used for irrigation the river affords a plentiful and unfailing supply of drinking water. At Konimelehalli, about six miles south-east of Bankápur, the Varda is crossed by a bridge of seven arches of fifty feet each and two of ninety-five feet each. During the rains there are ferries chiefly at Gondi, Mulgund, Adur, Devgiri, and Karajgi. The ferry boats are generally wicker baskets like those on the Tungbhadra.

*The Dharma.*

The Varda's chief feeder is the DHARMA, which joins it from the left in the north-east corner of Hángal. The Dharma rises in the Sahyádrí hills about twenty miles south-west of the town of Hángal, and after a north-easterly course of about thirty-five miles falls into the Varda about seven miles south of Bankápur. It is a small stream during most of the year. At Shringeri, about five miles west of Hángal, an old dam supplies a canal about twelve miles long, which feeds upwards of twenty-four large ponds and waters a large area of rice and sugarcane.

*The Kumadvati.*

In the extreme south of the district the KUMADVATI, rising in North Maisur, after a northerly course of about forty miles, enters Dhárwár about two miles to the south of Masur in Kod, and passing through a gap in the low range of hills in the south of that sub-

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division, after a north-easterly course of about twenty-five miles, falls into the Tungbhadra near Mudenur about eight miles south-west of Harihar. The stream flows between steep banks over a bed fifty to a hundred yards broad, which is sandy and shallow with long deep reaches. An old dam on the western border of the district, thrown across the river by the Vijayanagar or Anegundi kings (1336-1587) turns the Kumadvati into a large lake called Madak, entirely within Maisur limits. Two more embankments were also thrown across other gaps in the hills to the right and left of the Kumadvati valley to keep the waters of the lake from passing through them, and a waste channel was cut along the hills for the overflow waters. In some unknown flood, said to have happened soon after the work was completed, the water burst through the most westerly of the three embankments, and it is through this that the river now flows. In 1861 the old water-works which had fallen to ruin were partially restored by building a dam across the Kumadvati where it leaves the Madak lake, and cutting two irrigation channels, one on the right and the other on the left. The lake is about a mile long and in 1882-83 watered 480 acres. The top of the old dam is far up the hill-side.

The HIREHALLA rises in the Kappatgudd hills near Lakkundi about seven miles south-east of Gadag, and, after flowing south about twenty miles, joins the Tungbhadra at Rati six miles south of the bare hill-fort of Mundargigudd. A little above its meeting with the Tungbhadra the Hirehalla is about 500 feet broad. There is little flow of water in the hot weather, but during the rains its broad sandy bed is generally full. The banks are sloping and are of earth and gravel. The water is not used for irrigation.

The MALPRABHA, or Mud-Bearer, forming the north-east limit of the district for about sixteen miles, receives the drainage of all the Dhárwár streams which flow to the north and north-east. It rises to the south-west of the town of Belgaum, and after flowing east about sixty miles through that district, it passes for about twenty-five miles through the Southern Marátha States. Then for about sixteen miles it forms the boundary between the Ron and Navalgund sub-divisions of Dhárwár and the Bádámi sub-division of Bijápur. Beyond Dhárwár limits it passes north-east for about forty miles through the Bádámi and Hungund sub-divisions of Bijápur and falls into the Krishna at Sangam ten miles north of Hungund in Bijápur. Though during the rains it is a large stream, in the fair season the Malprabha has but a slight flow. Within Dhárwár limits the bed of the river, which is muddy and sandy, is 350 yards wide and its banks are sloping and earthy and about twelve feet high. Its water is not used for irrigation. The Dhárwár feeders of the Malprabha include almost all the streams of the northern half of the district. Except the Bennihalla none of these are of any size and during the hot months all are dry.

The BENNIHALLA, or Butter-Stream, rises at Dhundshi in Bankápur, flows north through Hubli Navalgund and Ron, and falls into the Malprabha before it turns north to pass through the Bádámi hills. It flows between high and steep banks of earth with a soft muddy bottom

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*The Hirehalla.*

*The Malprabha.*

*The Bennihalli.*



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*The Bennihalla.*

150 to 200 feet broad. Though very rapid in the rainy season, sometimes causing serious damage to crops, during the hot months water remains only in pools. Its high and steep earthy banks and muddy bottom make it difficult to cross during all except one or two of the driest months, and the fine earth in the bed of the river, though outwardly hard, is so soft that animals are said to have been swallowed up in it. It is a serious obstacle to the traffic of the east of the district. It is bridged on the Kárwár-Bellári road; wooden bridges at Helisur and Yárgal decayed and have been pulled down. Near Navalgund, about forty miles from its source, the Bennihalla receives from the north the Tuphrihalla or clarified butter stream, after a course of thirty-five miles from Kittur in Belgaum through the sub-divisions of Dhárwár and Navalgund. From the height of their banks and the long period through which their stream ceases to flow the waters of the Bennihalla and its feeders are little used for irrigation. Their water is also so brackish as to be hardly drinkable, and throughout the greater part of its basin good water is scarce. In times of flood the Bennihalla and its feeders carry off so much black soil that it is probably their waters which have given the Malprabha its name of mud-bearer.

*The Gangávali.*

THE GANGÁVALI OR BIDTIHALLA river, which falls into the sea between Gokarn and Ankola in North Kánara, has two of its sources in the sub-division of Dhárwár. One of these streams, which is called Bidtihalla, rises in the big pond at Mugad about eight miles west of Dhárwár; the other, which is called Shalmalla or Kallhalla, rises at Hoskatti about two and a half miles south of Dhárwár. These two streams flowing south join at Sungedevarkop, about three miles east of Kalghatgi. After their meeting at Sungedevarkop the streams go by the name of Bidtihalla. At Bagodgeri a dam was thrown across the united stream in 1871 and a canal cut five or six miles to the south. Through some fault of construction this work has proved a failure.

## WATER SUPPLY.

In the black plain to the north and east of the district the small streams dry early in the hot season and though as a rule water is found by digging in their beds, it is too brackish to be fit for drinking. The people depend on the supply which has been stored in ponds during the rains. This, partly from the difficulty of finding suitable pond sites in so level a country and partly from the scanty rainfall, does not meet the wants of the people. The well water is also apt to grow brackish, so that during the hot months the people of the plain villages are often put to serious inconvenience. They have sometimes to fetch their water two or three miles, while many have to move with their cattle to the banks of the Malprabha and Tungbhadra. In the hilly west and south, where there is a much more plentiful rainfall, the supply of water is abundant.

## GEOLOGY.

<sup>1</sup>Dhárwár contains specimens of granite, transition rocks, old red sandstone, trap rocks, and an iron-bearing claystone.

<sup>1</sup> The geological portion is prepared chiefly from Dr. A. T. Christie's and Captain Newbold's papers on the geology of the Southern Marátha Country in Carter's Geological Papers of Western India, 328-378.



At Ron, about fifty miles north-east of Dhárwár, granite is found with a dark-red felspar with small scattered crystals and minute veins of quartz. Throughout the felspar are many small bag-like hollows some of them lined with tiny crystals apparently of chlorite. North of Gadag the hypogene schists and granite stretch to Gajendragad in south Bijápur where they are covered by sandstone. On the road northwards from Lakmeshvar in Sávanur granite occurs in low bosses and detached blocks, and rises into a few clusters at the town of Kul Mulgund. In Bankápur numbers of granite boulders lie in unbroken lines generally parallel with the ranges of hills, but sometimes ranging more north to west. They often rise little over the surface, but more often, especially at Karajgi, stones varying in size from an egg to a cart-wheel are piled into large mounds. The texture is nearly as granular as gneiss.

Transition rocks fill a large part of the district. They stretch from the east and south where they succeed the granite to the western foot of the Sahyádris, being only in a few places broken by the granite which protrudes from beneath them. In parts of the Sahyádris they are covered by claystone and trap. In the north transition rocks are found only in the bottoms of the valleys which cross the sandstone hills; and in the centre and south they are covered by large plains of black cotton soil. To the west of Dhárwár the transition rocks form parallel ranges with a general south-east direction, the same as the direction of the strata of which they are composed. The chief rocks of this series are clay-slate, chlorite schist, talc-slate, gneiss, limestone, and quartz. The strata, which are generally highly inclined and in many instances vertical, seem to have a general direction of north-west and south-east.

The rocks composing the hills round Dhárwár are schists passing into slates and shales. The general structure which is perhaps more schistose and shaly than slaty, varies from a massive and obscure slate to fine plates and from compact and flinty to soft and sectile. The fine plates are nearly vertical and generally run parallel with the prevailing line of elevation which is north-west and south-east. The inlayering with beds of quartz rock and the jaspideous rock which generally forms crests and mural ridges on the hill is obscure. The lines of cleavage in slates are not necessarily those of the layering tops, cleavage lines being often caused by the arrangement of mica, chlorite, or talc. The rock passes from a green chloritic schist into all the shades of white, yellow, red, and brown, sometimes singularly arranged in stripes, in contorted and waving bands, red and white being the prevailing colours. Felspar in a clayey state of disintegration is the prevalent mineral blended with quartz and tinged with iron. The white varieties seldom contain flint enough to give them the character of kaolin. This variety which in hand specimens appears like porcelain earth is found in large quantities at Dhárwár.<sup>1</sup> It has an obscure slaty structure, the red varieties

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Granite.

*Transition Rocks.**Clay Slate.*

<sup>1</sup> Owing to the soft nature of the clay-slates wells are easily dug at Dhárwár. Sometimes red and sometimes white clay-slate occurs at the surface, the white to a depth of seventy feet. Some of the varieties when weathered assume a yellow ochre colour.

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with which it is associated being distinctly slaty. At Dhárwár these rocks are stratified. Several varieties are often found within a short distance of each other in the larger stratum and they are almost always crossed by thin veins of a brown quartz. Besides by the strata seams they are generally crossed by other parallel seams which pass through the strata.

*Chlorite Slate.*

Chlorite-slate is widely distributed through the centre and south of the district. Iron pyrites is seen in the rock which, particularly in the neighbourhood of trap dykes, tends to the prismatic and rhomboidal forms in which plating, though generally obscure, is sometimes distinctly traceable. A system of joints running nearly at right angles with those of the plating often intersects the whole group of the schists. Near Dhárwár is a variety intermediate between chlorite-slate and clay-slate. It has a bluish gray colour, a slightly greasy feel, is hard, and has a coarse slaty structure.<sup>1</sup> From Banvási in North Kánara the chloritic and coloured schists and slate-clays continue east-north-east to Sávanur.

*Gneiss.*

The rocks which form the Kappatgudd ridges of hills and the neighbouring country for miles together belong to the gneiss formation. They have been subjected to immense disturbances producing great contortions and fractures and in parts a much higher degree of metamorphism than is usually met with, which adds greatly to the difficulty of unravelling the very obscure stratigraphical features of these hills. Within the limits of the gold tract the ridge is single and its structure is simple. Further north the hills show a double series of hæmatite schist beds intercalated between chloritic and other schist of great thickness which to the east touches a broad band of highly silicious and often granitoid gneiss on which stands the town of Gadag. No section showing the exact relation of the two series is found, but it is probable that the granitoid series which may be called the Gadag series overlies the chloritic and ferruginous beds. Further south a third hæmatite schist-band appears at a little lower level also accompanied by chloritic, hornblendic, and micaceous schists, and bends round on itself in a sharp curve immediately north of the Kappatgudd hills, thus forming an anticlinal or dip-parting ellipsoid which is crossed by the road running from Dambal to Sortur. This series may be called the Dhoni series from the village of Dhoni which stands on it. It is noteworthy because it contains several important beds of gray and greenish-gray crystalline limestone of considerable thickness. The chief beds lie in two groups, the one two miles north-west of Dhoni, the other three miles south-west of that

<sup>1</sup> Captain Allardyce who examined the rocks about Dhárwár found that for an area of fifty to a hundred miles the direction of the laminae and of the stratification kept constant to one point namely north-west by north. He adds, one may pick a fragment of chlorite slate of a triangular pyramidal outline, the external planes of which will be ferruginous, while the interior is divided into minute laminae not ferruginous, and coincident with only one of the planes. Examination of the rock in place shows that this minute lamination is vertical and invariably divided north-west by north, conformable, in short, to the line of elevation. The chloritic schist north of Dhárwár is of a bluish green greasy to the touch, and sometimes so massive as to make a good building stone. Geological Papers of Western India, 362.

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*Gneiss.*

village. Overlying this to the west are other hæmatitic beds which along with their northern representatives may be called the Kappatgudd series from their forming the mass of the Kappatgudd hill. The character of the associated schistose beds has changed from chloritic to argillaceous, and the predominant colours of the rocks from green to reddish buff or mottled white. Owing to the great development of cleavage the true dip of these argillaceous schists is in many places completely obscured and their relations to the rocks next them to the west are very problematical. This next series consists of chloritic and hornblendic schists intimately associated with a massive dioritic rock. This dioritic rock, though in parts strongly resembling some of the diorites forming trap dykes which occur so frequently in the gneissic region does not appear to be an irruptive rock but rather a product of excessive metamorphism. The schistose rock appears to pass by imperceptible graduation into the highly crystalline mass. The two dissimilar rocks are never in close opposition, but everywhere some feet or yards of rock intervene showing the graduation of the special characters. This series, which may be called the Sortur series after the village of that name, occupies a band of country four to five miles broad which is bounded to the west by a band of granitoid gneiss of undetermined breadth. The position of this granitoid band, which may be called the Nulgund series relatively to the Sortur series, is uncertain; it is probable that the Sortur series is the younger of the two.<sup>1</sup>

Gneiss is also seen at Lakmeshvar in Sávanur on the bank of a stream running nearly east and west with a dip of 35° towards the south, and further north it rises into a low round-backed ridge.

Among the gneissic rocks are several conspicuous hæmatite schist beds. These, with others parallel to them, stretch south-east to Kittur and Dhárwár with a change of strike. A moderate-sized hæmatite schist-bed of a rich and dark purple and dipping east by north at a high angle forms a well-marked buttress on the south-east side of the Chik Nargund hill. Further south at Nargund, about thirty miles north-east of Dhárwár, a species of gneissic rock appears with a strike which is almost invariably north-north-west varying to north-west by north. The lower part of the hill, which rises abruptly from the black plain, consists of schistose varieties of gneissic rocks which are capped by several feet of typical quartzites forming a narrow plateau about a mile long with a very fine series of precipitous scarps all round. The contact of the basement bed and underlying gneissic schist is seen on the path leading up to the Nargund fort. At that spot the schist is a gray to purple gritty micaceous schist dipping 50° to 70° east by north. On the schist is a bed of brecciated quartzite conglomerate from one and a half to four feet thick, overlaid by bluish waxy quartzite, and this again by buff and pale salmon beds. On the summit the beds dip from both ends towards the centre with a slight southerly inclination at angles of 5° to 10°. The west end is rather higher than the east end and is about 1000 feet above the plain.<sup>2</sup>

<sup>1</sup> Mr. Foote's Report in General Department, XXII. of 1874.

<sup>2</sup> Memoirs of the Geological Survey of India, XII. (Part I.) 101-103.

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*Talc Slate.*

Talc-slate occurs in the centre of the district. Here talc is frequently mixed with quartz, and the rock has the general appearance of mica-slate. At Nargund and Chik Nargund the strata of this variety have a nearly vertical dip, and their direction is south-east by south. In the south-east of the district, potstone and soapstone are found associated with the talc-slates.

*Limestone.*

In the north-east of the district limestone of a yellowish, gray, blue, and whitish colour is found. Its strata are highly inclined and their general direction appears to be north by west, and south by east. The fracture is generally flat conchoidal.

*Quartz.*

Chik Nargund hill is capped by an inclined plane of quartzites dipping  $30^{\circ}$  to  $35^{\circ}$  north-east. The north side of the inclined plane is probably faulted against the gneiss, but the base of the hill is so obscured by talus or rock-ruins cemented into a breccia by the soaking in of tufaceous limestone that it is impossible to trace the fault. In the whole country from Dhārwar to beyond Kittur in Belgaum the quartz occurs in large beds forming summits of parallel ranges of hills. These beds have resisted the attacks of weather while the soft clay-slates with which they are associated have given way. The quartz in these beds is in general deeply coloured with iron; but there are some varieties which have a gray colour, a splintery fracture, and a resemblance to hornstone. In many instances the base of the rock is white or gray and is crossed in all directions by dark-brown veins highly charged with iron. In some specimens the dark-brown variety is in much larger quantity than the white basis; and then the white appears as if it had been broken into a number of small angular fragments which had been afterwards united by the consolidation of the brown variety from the fluid form. This variety, containing numerous small hollows which are lined with red hæmatite in the shape of stalactites, or having a blistered or mammillary form, is found in the Kappatgudd range.

*Old Red  
Sandstone.*

Old red sandstone occupies all the north-east corner of the district. It also forms the summits of the Navalgund and Nargund hills on all of which it appears in large tabular masses. These hills have horizontal strata, level summits, and for many miles keep the same height. At Navalgund the sandstone rests on granite, and at Nargund on the talc-slates of the transition class. In the hills of Nargund and Chik Nargund both the sandy and the compact varieties are found very near each other. In one part of the Chik Nargund hill the compact variety has on a large scale somewhat of a spheroidal structure. In the south-east of the Nargund hill is a large mass of a diaphanous quartz of bluish colour and with scattered grains of felspar.

*Trap.*

Trap rocks do not occur in great abundance. Basaltic green stone, also called diorite, consists almost wholly of hornblende, being largely granular and entirely crystalline and of a dark-green colour. It occasionally appears mixed with spots of white and light green when it is composed of equal quantities of felspar and hornblende. Dykes of this formation sometimes stand from

the surface in long ridges which appear like lines of rocks. In other places greenstone occurs in loose spheroidal blocks and pieces on the surface and partly imbedded in the soil generally pointing to an underlying dyke. Granite and greenstone dykes are occasionally seen at the base of the hills west of Dhárwár and Hubli, where the jaspideous and chloritic schists forming these hills bear evident marks of the alteration produced by the intrusion of these dykes. From Hubli south to the Maisur frontier such greenstone dykes become more frequent. Near the centre of the Kappatgudd hills an immense dyke of basaltic greenstone emerges from the base of the strata. Numerous smaller dykes cross other parts of the extensive plain to the west, north, and east of these hills. Near Sávanur dykes of green-stone become more frequent accompanied by depositions of limestone which fills fissures in the schists and overspreads their surface beneath the alluvial soil. The direction of the beds at Sávanur suffers a deflection after leaving Dhárwár of about 40°, being nearly due north and south, dipping at an angle of about 40° towards the east. They end on the north-east between Sávanur and Gadag close to Lakmeshvar. Here a spur from the chief north and south line of elevation runs nearly east and west dipping towards the south. Several similar spurs are crossed between Banvási and Lakmeshvár, and the dykes of the greenstone run in a similar direction.

Iron-bearing clay-stone or laterite occurs in different parts of the district, but chiefly in the west. In different stations it is found resting on granite, transition rock, trap, and sandstone.

The climate of the district is on the whole healthy and agreeable. It is pleasantest in a tract parallel with the Sahyádrí crest between the western forests and the treeless east, within whose limits lie Dhárwár, Hubli, Kod, and Bankápur. The year may be divided into five seasons. Shower months from the middle of April to the beginning of June; the south-west rains from June to October when the climate is cool and damp; the north-east rains in October and November; the cold months December, January, and half of February; and the hot months, with harsh east winds, from the middle of February to the middle of April. The first signs that fresh south-west rains is beginning are the morning fogs that often cover the country till about nine o'clock in March. The air is hottest about the beginning of April, the temperature sometimes rising to 100° or 103°. By the middle of April the height of the hot season, which is never severe, is over. The easterly winds blow with less force and at times give way to a westerly breeze which lowers the temperature in the day time and cools and freshens the nights. During the calms between the regular east and west winds, towards the end of March and in April, whirlwinds or as they are locally called *dova-gháli* or devil winds are common. A number of dust columns in the form of a speaking trumpet or a waterspout chase each other over the treeless plain from east to west or south-east to north-west making a vortex of heated air whose whirl raises dust, sand, straw, baskets, clothes, and other light articles sometimes 200 to 300 feet high. They come

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and go with great suddenness with a startling rush from all sides to a central axis round which the air whirls furiously.<sup>1</sup> For a time the east wind blows by day and the west wind by night. By the middle of May the west wind begins to freshen and lasts through the day. After the west breeze has set in short sharp thunderstorms with rain and hail are common. These early showers are very useful. They fill the ponds, cover the country with fresh grass, and soften the soil so that the rice lands are ploughed and sown, and by the end of May are green with young rice. Towards the end of May the west wind begins to blow stronger, banks of cloud gather in the south-west, and in the west early in June, about a week after it has broken on the coast, the regular south-west rains set in. The first heavy showers come from the east. During the day the wind blows steadily from the south-west, till between three and five in the afternoon black clouds gather in the east. Then cloud rises over cloud until the whole eastern sky is one dense black mass which with lightning and thunder moves slowly against the western breeze. When the mass of cloud draws near, a sudden and strong east wind brings heavy battering rain and sometimes hail. During the storm the direction of the wind changes frequently until it sets steadily from the west, and the tempest ceases. These storms take place daily for several days and after they are over for five or six months the wind continues to blow constantly from the west. Storms also occur at the autumnal equinox, but neither so regularly nor so violently as at the close of May. Though there is much wet weather at Dhárwár, the rain seldom falls in such deluges as on the coast, and the whole yearly supply is less than either along the western coast or along the Sahyádris. During the early months of the south-west rains the eastern sub-divisions have but a small share. Most of their rain falls about October.

At Dhárwár and Hubli most rain falls in May, July, and October; towards the east and south the fall in May and October is greater than in July. The Poona-Harihar road, running north-west and south-east, divides the district into two belts, a west belt of steady and of comparatively heavy rain, and an east belt of uncertain and

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<sup>1</sup> Kies' Southern Marátha Country, 18. Lieutenant Moore describes one of these whirlwinds in 1790. The day after Major Sartorius marched from Dhárwár so furious a squall and whirlwind passed over the ground he had left, that nothing could withstand its violence. Two or three gentlemen who remained on the ground sick, had their tents and furniture swept away. We saw the remains of a chair that had been so whirled about and battered as to leave little trace of its former shape. We found Dhárwár particularly subject to whirlwinds. Scarcely a day passed without perhaps a dozen being seen, and on most days several visited our line. They may be seen at a great distance in the form of an immense column moving irregularly with considerable rapidity and with a great noise. Clouds of dust, and anything light, such as pieces of paper cloth and leaves, are whirled to a height beyond the reach of the eye, forming a column perhaps twenty or thirty feet at the base. Most are strong enough to knock over a tent unless well secured. The confusion when one came among the tents and huts of ours or of the Marátha camp was ludicrous. It would beat down a hut, and carry with it the only dress of the inmates who might be seen in half-naked pursuit. Sometimes the wind would scatter fire and burn huts and tents. Every one called them devils, and when one drew near all began to shout and abuse it, so that between the noise of the devil itself and of the devil's abusers good warning was given of its approach. Narrative of Captain Little's Detachment, 49.

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scanty rain. In the western belt, both as regards the sufficiency and the seasonableness of the rain, the extreme west is more favoured than the country farther east. In the Dhárwár sub-division west of the Belgaum road the rainfall increases every mile till near the western limit the south-west rain is fully fifty per cent heavier than at Dhárwár.<sup>1</sup> Among the western towns for which returns are available are Kalghatgi and Hángal, about seven miles from the western limit of the district. They have an average fall of thirty-one inches, the Kalghatgi fall varying from forty-six inches in 1882 to nineteen inches in 1871 and 1876, and the Hángal fall varying from sixty-four inches in 1882 to twenty-two inches in 1867 and 1876. Mugad and Dhárwár, about twelve and fifteen miles from the western border, have an average yearly rainfall of thirty inches, the Mugad fall varying from fifty-two inches in 1878 and 1882 to sixteen inches in 1865, and the Dhárwár fall varying from fifty inches in 1882 to sixteen inches in 1876. Hubli, about seventeen miles from the western border, has a fall varying from forty-three inches in 1874 to eight inches in 1865 and averaging twenty-three inches. And Misrikota, about ten miles from the western border, has a fall varying from thirty-one inches in 1861 to nine inches in 1865 and averaging twenty-two inches. Within fifteen miles to the east of the Poona-Harihar road the clouds, driven east by the south-west wind, have been so drained in the west that they yield nothing but a trifling drizzle. Another ten or fifteen miles further east the clouds fly high overhead without yielding moisture for weeks together. After another fifteen or twenty miles these rain-clouds seem again to condense, and water the earth in frequent showers during June, July, and August.<sup>2</sup> If it were not for the north-east or Madras monsoon much of the country would be liable to famine. In the west of the eastern belt, with scanty south-west rain, are Shigaon on the Poona-Harihar road about six miles north of Bankápur with a rainfall varying from forty-four inches in 1882 to twelve inches in 1862 1863 and 1866, and averaging twenty-two inches; Karajgi, with a rainfall varying from thirty-four inches in 1873 to eight inches in 1866 and averaging twenty-one inches; and Ránebennur, with a rainfall varying from thirty-five inches in 1874 to five inches in 1863 and averaging nineteen inches. In the centre of the eastern belt, with little south-west rain, are Navalgund with a fall varying from forty inches in 1874 to six inches in 1863 and averaging twenty inches, and Gatal with a fall varying from eighteen inches in 1867 to seven inches in 1865 and 1866 and averaging twelve inches. In the east of the eastern belt with seasonable south-west rain are Nargund with a fall varying from thirty-seven inches in 1878 to six inches in 1863 and 1865 and averaging nineteen inches; Gadag, with a fall varying from fifty-two inches in 1874 to six inches in 1866 and averaging twenty inches; Mundargi, with a fall varying from thirty-six inches in 1874 to two inches in 1876 and averaging nineteen inches; and Dambal, with a fall varying from twenty-five inches in 1870 to four inches in 1865 and averaging eleven inches. The details are:

<sup>1</sup> Bom. Gov. Sel. CLXI. 4.

<sup>2</sup> Bom. Gov. Sel. CLVIII. 97.



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## DHÁRWÁR RAINFALL, 1861-1882.

STATION.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
Dhárwár	32	24	20	29	18	...	29	31	27	31	30	27
Mugad	31	20	28	22	10	20	19	25	28	36	33	31
Hubli	19	10	10	17	8	16	13	22	21	29	28	23
Navalgund	15	17	6	20	12	10	18	15	25	29	19	18
Nargund	33	13	6	17	6	7	19	14	24	25	20	14
Gadag	16	13	7	11	8	6	21	14	17	25	19	18
Shiggaon	18	19	12	17	14	12	21	21	16	26	18	21
Ranebennur	12	7	5	13	8	8	20	21	17	19	22	22
Hangal	31	23	24	23	25	23	23	29	35	31	27	38
Kurajgi	13	10	10	20	11	8	17	18	17	21	24	28
Kalghatgi	...	...	...	...	...	...	...	...	...	41	19	29
Mundargi	...	...	...	...	...	...	...	...	...	...	23	15
Dambal	9	6	6	11	4	7	13	11	21	25	...	...
Mishrikoti	31	24	15	23	9	20	25	26	28	...	...	...
Guttal	13	...	17	13	7	7	13	14	...	...	...	...

STATION.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	AVER- AGE.
Dhárwár	27	48	31	16	35	40	38	35	32	50	30.2
Mugad	30	43	36	23	36	52	32	23	28	52	30.2
Hubli	21	43	13	14	40	42	31	25	21	37	23.13
Navalgund	11	40	15	7	36	38	24	24	15	34	20.3
Nargund	13	30	20	8	29	37	24	21	16	32	19.11
Gadag	16	52	21	8	31	39	25	27	20	36	20.1
Shiggaon	17	27	21	15	39	35	28	27	25	44	22.2
Ranebennur	18	35	17	7	34	34	33	23	15	23	19.2
Hangal	30	55	29	22	35	29	26	39	31	64	31.9
Kurajgi	34	29	13	12	29	28	32	29	31	33	21.1
Kalghatgi	25	43	32	19	27	35	29	35	23	46	31.1
Mundargi	14	36	10	2	21	24	21	19	20	25	19.2
Dambal	...	...	...	...	...	...	...	...	...	...	11.8
Mishrikoti	...	...	...	...	...	...	...	...	...	...	22.3
Guttal	...	...	...	...	...	...	...	...	...	...	12.5

In the west, during October and November, the mornings often open with heavy fog and dew. As soon as the rains are over, before the beginning of November, a constant cold breeze sets in from the east or north-east. This wind brings with it the north-east or Madras monsoon. In the eastern sub-divisions there is generally a considerable rainfall at this time, and, in November and December, even as far west as Dhárwár, there are occasional showers.

Throughout the district, during December and January, the days are clear and cool, the nights cold, and the east wind bleak dry and piercing. In December and January there are generally heavy dews. About the beginning or middle of February the climate suddenly changes from cold to hot, the heat increasing till about the beginning or middle of April. The days are clear and hot, though the heat is never so trying as in many parts of the Bombay Deccan, and, except in the east, the nights are almost always cool. During these dry weeks, in the noontide glare, a traveller crossing one of the swellings of the black soil plain sometimes finds himself close to the shore of a wide island-studded sea. This is the sun horse *bisu lukudura* or mirage and the islands are the twisted line of the distant hills.

Thermometer readings at Dhárwár for the five years ending 1882 give a maximum temperature of 99° in April 1878 and a minimum temperature of 58° in December 1882. During the four months from February to May the maximum temperature has varied from

86° to 99°, the minimum temperature from 66° to 74°, the mean maximum from 81° to 96°, the mean minimum from 70° to 77°, and the mean range from 7° to 22°; from June to October the maximum has varied from 75° to 90°, the minimum from 68° to 70°, the mean maximum from 72° to 94°, the mean minimum from 63° to 74°, and the mean range from 3° to 20°; and from November to January, the maximum has varied from 81° to 94°, the minimum from 58° to 70°, the mean maximum from 75° to 89°, the mean minimum from 62° to 71°, and the mean range from 6° to 23°. The following table gives the details :

DHÁRWÁR THERMOMETER READINGS, 1878-1882.

YEAR.		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1878.	Maximum ...	89	97	98	99	97	90	85	86	86	86	84	82
	Minimum ...	70	69	73	72	74	70	70	70	69	70	70	69
	Mean Maximum...	89	95	95	96	94	86	79	78	79	81	83	80
	Mean Minimum...	70	72	74	75	74	73	70	71	71	72	70	70
	Mean Range ...	18	22	20	21	20	13	8	16	8	9	12	10
1879.	Maximum ...	81	90	93	92	91	85	80	75	82	88	88	85
	Minimum ...	67	69	73	72	67	68	70	69	68	70	70	61
	Mean Maximum...	76	81	90	87	89	81	77	75	78	83	86	83
	Mean Minimum...	67	73	77	73	72	70	70	69	69	70	70	63
	Mean Range ...	7	7	13	14	16	11	7	6	8	13	16	20
1880.	Maximum ...	89	88	90	92	92	83	75	79	77	84	82	87
	Minimum ...	65	66	70	71	70	68	68	68	68	69	69	65
	Mean Maximum...	76	84	85	88	89	79	72	75	72	75	78	83
	Mean Minimum...	69	70	70	72	72	73	63	60	64	71	71	68
	Mean Range ...	6	13	14	16	16	5	9	5	7	4	7	15
1881.	Maximum ...	87	86	95	99	98	88	76	82	79	78	85	86
	Minimum ...	64	68	69	70	69	70	69	69	70	70	65	60
	Mean Maximum...	86	82	91	92	92	81	74	75	76	75	80	87
	Mean Minimum...	67	70	72	72	74	71	71	63	70	72	68	65
	Mean Range ...	19	11	13	19	17	10	3	7	6	8	12	21
1882.	Maximum ...	83	92	98	96	96	88	87	84	89	94	90	
	Minimum ...	64	63	69	72	68	70	70	69	68	61	58	
	Mean Maximum...	85	89	92	93	92	80	78	81	79	82	85	85
	Mean Minimum...	68	71	71	73	73	72	71	71	70	71	67	62
	Mean Range ...	17	18	21	19	19	8	5	10	9	10	17	23

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